

Lecture Module - To Err is Human

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

Topic 1 - Accuracy and Error

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- Thought Experiment
- Accuracy and Error
- Estimating Error
- Uncertainty Interval

Thought Experiment

Thought Experiment: Look around the room and choose an object. It can be anything. Ask yourself the following questions.

- What is the **true** length of the object?
- How can you find the **true** value? Can you measure it?
- ...



Image: T.Hill

Accuracy and Error

The exact value of a variable is called the _____.
_____. The value of the variables as indicated by a
measurement system is called the _____.
_____. The _____ of a measurement
refers to the closeness of agreement between the
_____ and the _____.
_____. But the _____
_____ is rarely known *exactly*, and various influences,
called _____, have an effect on both of these values.
So the concept of the _____ of a measurement is a
qualitative one.

$$\text{error} = \text{measured value} - \text{true value}$$

Estimating Error

The _____ can be estimated but cannot be known *exactly*. In practice a _____ value is used in place of the true value. We will discuss this again the the *Calibration Module*.

$$\text{accuracy} = \frac{|\text{error}|}{\text{reference value}} \times 100$$

An estimate of error based using this value is sometimes referred to as _____.

Uncertainty Interval

"The _____ is a numerical estimate of the possible range of the error in a measurement. In any measurement, the _____ is not known exactly since the true value is rarely known exactly. But based on available information, the operator might feel confident that the error is within certain bounds, a plus or minus range of the indicated reading. This is the assigned _____."

We will discuss this again the the *Uncertainty Module*.

Text: Theory and Design of Mech. Meas.